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Risk and Protective Factors of Different Functional Trajectories in Older Persons: Are These the Same?

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We examined whether risk and protective factors of different functional trajectories were the same in 1,765 Dutch older persons. We assessed disability in 1993 and reassessed it in 2001. For 2001 as compared with 1993, we distinguished three trajectory groups: substantially poorer, somewhat poorer, and no change or better functioning. We assessed sociodemographic, health, and psychosocial potential risk or protective factors in 1993. When we analyzed them separately, risk and protective factors had similar (but mirrored) associations with functional trajectories. However, in a multivariate approach, we identified old age, depressive symptoms, and low mastery as risk factors for functional decline, whereas we identified young age, good perceived health, and self-efficacy expectancies as factors that predicted trajectories of healthy functioning. Risk and protective factors of functional trajectories in older persons are not the same.

THE ATTENTION on research on risk factors of functional decline in older adults has increased during the past decade. Knowledge about the determinants of disability will help researchers to set priorities for future research and facilitate the development of programs to prevent or delay the onset of disability or to improve functional ability in late life. In this article we focus on the differences between risk factors and protective factors of functional trajectories in older adults.

Studies on the risk factors of functional decline in older adults have included a range of sociodemographic, health and psychosocial determinants. For example, in an extensive review, Stuck and colleagues (1999) reported substantial associations between functional decline in community-living older adults and depression (positive association), (co)morbidity (i.e., disease burden; positive), self-rated health (negative), and social contacts (negative). The positive (protective) effects of psychological characteristics (e.g., self-efficacy expectancies, perceived control) on functional ability among older adults have been studied as well (e.g., Kempen, Ormel et al., 2003; Kempen et al., 2005; Kempen, Van Sonderen, & Ormel, 1999; Mendes de Leon, Seeman, Baker, Richardson, & Tinetti, 1996; Seeman, Unger, McAvay, & Mendes de Leon, 1999). Most of these studies reported low to moderate associations between such psychological attributes and (self-reported) daily functioning in old age. In contrast, Seeman and colleagues (1994) did not find any associations between psychological factors (self-efficacy beliefs, mastery) and physical performance (such as timed measures for balance and gait). Furthermore, the analysis of the impact of sociodemographic variables on functioning has been of interest. Age, gender, and social class differences in disability have been reported frequently (e.g., Ahacic, Parker, & Thorslund, 2000; Kempen, Scaf-Klomp, Sanderman, & Ormel, 2003; Parker, Thorslund, & Lundberg, 1994). Women, blue-collar workers, and persons in old age generally reported more functional problems than men, white-collar workers, and younger persons.

This short review shows that health indicators, both psychosocial attributes as well as sociodemographic factors, have been identified as potential risk factors for functional decline in older adults. However, most of these studies used mixed samples of older persons and included follow-up periods with a maximum of several years; in addition, only a very few of them distinguished between predictors of functional decline and predictors of healthy functioning (e.g. Seeman & Chen, 2002; Seeman et al., 1994). Most epidemiological researchers in the area of gerontology have focused on the identification of risk factors for functional decline. For example, associations between depressive symptoms and functional outcomes have been identified: more symptoms result in more dysfunctioning, and fewer symptoms in better functioning. However, some elderly persons may develop trajectories of healthy functioning (without functional decline), whereas others experience substantial functional decline. Some functional decline over a couple of years can be considered to be a natural pathway of aging, but it is questionable whether (protective) predictors of trajectories of healthy functioning in older persons can be considered to be the same as predictors of functional decline. Some predictors may have pathological effects, whereas others may be more salutogenic or protective (Antonovsky, 1987; Lamprecht & Sack, 2003). The existence of depressive symptoms, for example, may be predictive for subsequent dysfunctioning in older persons, but the *absence* of depressive symptoms may not be sufficient for healthy functioning; other factors may be at work here. The opposite may hold for other predictors. This theme is indirectly related to the theoretical debate about compression of morbidity (i.e., with disease and disability postponed to later ages) versus expansion of morbidity (whether people live longer with greater burdens of disease and disability; see, e.g., Fries, 1989; Robine & Michel, 2004). Although there is no definite empirical evidence for one or both trajectories, knowledge about the predictors of either trajectory of functional decline or healthy functioning may be helpful in this debate.

Knowledge about such differences may also be important for the development of programs and interventions to decrease disability and promote healthy functioning in older persons.

Mackenbach, Van den Bos, Joung, Van de Mheen, and Stronks (1994) are some of the very few researchers who have compared the determinants of excellent health (indicated by an index of self-rated health, chronic conditions, and an inventory of subjective health complaints) and the determinants of ill health. However, their study was cross-sectional, included a cohort of 15- to 74-year-old people, and was largely focused on sociodemographic and lifestyle determinants. Mackenbach and colleagues concluded that (a) the processes by which excellent health is generated probably have much in common with those that generate ill health, and (b) it is obvious that our understanding of the determinants of ill health is better than that of the determinants of excellent health; further study of the latter is recommended. Seeman and Chen (2002) more recently studied risk and protective factors for physical functioning over a 2.5-year period in older adults with and without chronic conditions. They identified a consistently protective effect of regular physical activity across all disease groups and differential effects of social and psychological factors for specific disease groups.

In the present article, we examine to what extent predictors of functional decline (risk factors) are the same as predictors of healthy functioning (protective factors) in a large cohort of older, independently living persons over an 8-year period. We assessed disability (as indicator of functioning) in 1993 and reassessed it in 2001. We distinguished between three kinds of trajectories in functioning: substantially poorer functioning in 2001 as compared with 1993, no change or better functioning in 2001 as compared with 1993, and somewhat poorer functioning in 2001 as compared with 1993. We used this latter "natural" functional trajectory as reference in our analytic approach. Furthermore, we assessed three sociodemographic, three health, and four psychosocial potential risk or protective factors in 1993.

Methods

Participants

The persons in this study participate in the Groningen Longitudinal Aging Study (GLAS). The GLAS is a population-based prospective and longitudinal study on the determinants of health-related quality of life of older people who are living independently in the north of the Netherlands, either in the community or in sheltered accommodations. Eligible were all patients of 57 years and older from 27 general practices linked to a local morbidity registration network (99% of the non-institutionalized persons aged 57 years or older in the Netherlands are registered in general practices). In 1993, 5,279 people completed baseline assessments (62% of the eligible source population); 4,792 were interviewed at home and completed self-report questionnaires, and 487 answered a shorter version of the questionnaires by telephone. Participants were asked to give informed consent to be approached for follow-up studies stemming from the baseline assessment. The objectives and design of the GLAS-baseline study have already been described in the literature (Kempen, Jelicic, & Ormel 1997; Kempen, Ormel, Brilman, & Relyveld, 1997; Ormel et al., 1998).

We have studied the representativeness of the baseline sample (as compared with the source population) in three ways. First, we identified some gender and age differences between the eligible persons (source population) and the baseline participants: 58% of the participants were females in the source population and 56% were females in the baseline sample. In addition, the oldest old persons (80+) were underrepresented in the baseline sample: 57% of the baseline participants were 57–69 years of age, 32% were 70–79 years of age, and 11% were 80 years of age or older; 52% of the source population were 57–69 years of age, 32% were 70–79 years of age, and 16% were 80 years of age or older, respectively (Kempen, Jelicic, et al., 1997). Second, we compared baseline participants and nonresponders on four clusters of physician-registered morbidity: malignant neoplasms, ischemic heart disease and congestive heart failure, chronic respiratory disease, and chronic diseases of the locomotor apparatus. Multiple logistic regression analyses, including age and gender, showed no significant effects ($p < .05$) of the latter three on nonresponse. We found a significant ($p < .05$) effect for malignant neoplasms (higher proportion of patients among nonresponders), but it was quite small. Third, we found only marginal differences in disability and chronic disease prevalences between older persons in the Dutch General Health Surveys and the participants in our baseline study. The results of these analyses showed no specific evidence of nonresponse bias relevant to the issues addressed in our study (Kempen, Jelicic, et al.).

In 2001, 8 years after the baseline assessment, we reapproached 3,216 persons with a self-report questionnaire with a selection of baseline measures; we did not reapproach 2,063 persons at that time because the GLAS office was previously informed that baseline participants had died between 1993 and 2001 ($n = 783$) or were not willing to participate anymore in the study ($n = 1,280$). From the 3,216 baseline participants who were sent the questionnaire, another 180 had died between 1993 and 2001, 688 refused to return the questionnaire, and 216 were lost to follow-up, leaving 2,132 persons who returned the questionnaire to the GLAS office. From these 2,132 persons, 75 did not complete all the measures and another 292 persons only received the telephone baseline interview (see earlier discussion), which excluded several measures used in this article. Therefore, 1,765 persons are included in our analyses.

Measures

We assessed disability with the Groningen Activity Restriction Scale (GARS; see Table 1). The GARS is a one-dimensional, hierarchical scale measuring grades of difficulties a person may experience when carrying out activities of daily living (ADLs) and instrumental activities of daily living (IADLs). The scale comprises 18 items referring to activities in the domains of personal care (ADLs) and domestic care (IADLs), and each item has four response categories (theoretical range = 18–72). The GARS was earlier used in several studies in the Netherlands and in a multicenter longitudinal European study, known as EURIDISS, on incapacitating diseases (Suurmeijer et al., 1994). The GARS meets the stochastic cumulative scalability criteria of the Mokken model (Kempen, Miedema, Ormel, & Molenaar, 1996; Kempen & Suurmeijer, 1990) and has proven its effectiveness for measuring levels of disability in international, comparative, and longitudinal studies, both across countries and across diseases. We measured

disability at baseline in 1993 and at follow-up in 2001. The internal reliability estimate was .91 at baseline.

We selected chronic medical conditions, perceived health, and depressive symptoms as health status predictors. We administered a checklist of 19 chronic medical conditions: asthma or chronic bronchitis, pulmonary emphysema, heart condition, hypertension, (consequences of) stroke, leg ulcer, stomach ulcer, liver disorder or gallstones, kidney disease, diabetes mellitus, thyroid gland disorder, back problems for at least 3 months or slipped disc, joint conditions or arthritis, prostate problems (only men), migraine or chronic headache, cancer, multiple sclerosis, Parkinson's disease or epilepsy, and serious dermatological disorders like psoriasis and eczema. We asked participants whether they suffered from one of more of these conditions in the 12 months prior to the interview. This procedure was similar to procedures used by Statistics Netherlands (CBS) in periodic health surveys. In order to reduce report bias, we counted only those conditions that required a general practitioner or specialist consult or prescription of medicine. We used the number of medical conditions as an index. We assessed perceived health (or self-rated health) with the five-item health perception subscale of the MOS Short-Form General Health Survey (SF-20; Stewart, Hays, & Ware, 1988). The score for the SF-20 ranges from 0 to 100, with higher scores indicating better functioning. The internal reliability estimate was .89. We assessed depressive symptoms with the seven-item depression subscale of the Hospital Anxiety and Depression Scale (HADS; Alyard, Goodling, McKenna, & Snaith, 1987; Spinhoven et al., 1997). The HADS was originally developed to reveal possible depressive states in a medical outpatient clinic setting. Items referring to symptoms that may have a physical cause (e.g. insomnia and weight loss) are not included in the scale. Therefore, the HADS is considered to be unbiased by coexisting general medical conditions (Spinhoven et al.). The theoretical score range of the scale varies from 0 to 21; higher scores indicate more symptoms. The internal reliability estimate was .71.

We selected four psychosocial predictors: social support interactions, neuroticism, mastery, and self-efficacy expectancies. We measured social support interactions with the 12-item Social Support List (Kempen & Van Eijk, 1995). It reflects the extent of perceived support received through interactions with members of a person's primary social network. Scores on this 12-item scale may range from 12 to 48; higher scores indicate more social support. The internal reliability estimate was .83. We used the Eysenck personality questionnaire (EPQ) to measure neuroticism or emotional instability (Eysenck & Eysenck, 1991; Sanderman, Arrindell, Ranchor, Eysenck, & Eysenck, 1995). The EPQ is a 12-item subscale that theoretically ranges from 0 (low neuroticism) to 12 (high neuroticism), and its internal reliability estimate was .82. We measured mastery (or perceived control) with the 7-item mastery scale (theoretical range 7–35) developed by Pearlin and Schooler (1978). This concept concerns the extent to which one regards one's own life chances as being under one's own control in contrast to being fatalistically ruled. Higher scores indicate more mastery. The internal reliability estimate for mastery was .79. We measured self-efficacy expectancies, that is, the extent to which people believe that they can perform a certain behavior, with Sherer's general self-efficacy scale (Sherer et al., 1982). It theoretically ranges from 16 to 80, with higher scores indicating more self-efficacy. The internal reliability was .84.

Table 1. Description of GARS Items and Response Options

Can you, fully independently . . .

- dress yourself
- get in and out of bed
- stand up from sitting in a chair
- wash your face and hands
- wash and dry your whole body
- get on and off the toilet
- feed yourself
- get around in the house (with a cane, if necessary)
- go up and down the stairs
- walk outdoors (with a cane, if necessary)
- take care of your feet and toenails
- prepare breakfast or lunch
- prepare dinner
- do light household activities (e.g., dusting and tidying up)
- do heavy household activities (e.g., mopping, cleaning the windows, and vacuuming)
- wash and iron your clothes
- make the beds
- do the shopping

Answer options:

1. Yes, I can do it fully independently without any difficulty.
2. Yes, I can do it fully independently but with some difficulty.
3. Yes, I can do it fully independently but with great difficulty.
4. No, I cannot do it independently; I can only do it with someone's help.

Note: GARS = Groningen Activity Restriction Scale.

We selected sex, age, and educational level as sociodemographic covariates. We assessed the latter according to the International Standard Classification of Education (United Nations Educational, Scientific, and Cultural Organization, 1976). The index distinguishes six levels of education: no (elementary) school, elementary school, vocational training, high school, undergraduate degree, and graduate degree. The level of education is based on both standard formal education and vocational courses during adult life.

The psychometric properties of the Dutch versions of the SF-20 (Kempen, 1992), HADS (Spinhoven et al., 1997), EPQ (Sanderman et al., 1995), mastery scale (Kempen, Van Heuvelen et al., 1999) and self-efficacy scale (Bosscher, Smit, & Kempen, 1997) were approved in previous (pilot) studies. We assessed all predictors at baseline in 1993.

Analytic Strategy

We computed descriptive statistics for all variables for the total sample and for three groups according to changes in disability between 1993 and 2001. Next, we computed intercorrelation coefficients between the selected predictors and between these predictors and baseline disability. Then, we distinguished one group with no change or improvement in functioning between 1993 and 2001 ($n = 737$). A second group, more or less equal in numbers, refers to substantially poorer functioning in 1993 as compared with 2001: at least a deterioration of 4 points on the GARS ($n = 643$). Finally, we created a reference group with somewhat poorer functioning in 2001 as compared with 1993: a deterioration of 1, 2, or 3 points on the GARS ($n = 385$). This latter reference group reported some functional decline that can be considered to be a reflection

Table 2. Study Sample Characteristics According to Three Levels of Change in Disability Between 1993 and 2001 and for Total Sample in 1993

Variable	Change in Disability Between 1993 and 2001[a]			Total Sample (N = 1,765)
	Substantially Poorer Functioning (n = 643)	Some Poorer Functioning (n = 385)	No Change or Better Functioning (n = 737)	
Disability in 1993 (GARS)	21.9 (6.0)[c,d]	19.6 (3.9)[c]	20.0 (4.7)[d]	20.6 (5.2)
Disability change 1993–2001 (GARS)	12.5 (8.7)[c,d]	1.9 (0.8)[c,e]	−1.1 (3.2)[d,e]	4.5 (8.4)
Covariates				
Gender (% female)	61.1%[b]	61.8%[b]	48.3%[b]	55.9%
Age	70.0 (6.8)[c,d]	66.8 (5.6)[c,e]	64.3 (5.5)[d,e]	66.0 (6.6)
Educational level	3.2 (1.1)[c]	3.3 (1.1)	3.5 (1.1)[c]	3.3 (1.1)
Predictors				
No. of chronic conditions	1.3 (1.2)[c,d]	0.9 (1.0)[c]	0.8 (1.0)[d]	1.0 (1.1)
Perceived health[f]	64.6 (23.8)[c,d]	73.3 (20.6)[c,e]	77.9 (20.5)[d,e]	72.0 (22.6)
Depressive symptoms[g]	4.6 (3.4)[c,d]	3.5 (2.9)[c,e]	3.0 (2.8)[d,e]	3.7 (3.1)
Social support[f]	25.8 (4.8)	25.8 (4.6)	25.9 (4.8)	25.9 (4.8)
Neuroticism[g]	3.9 (3.2)[c,d]	3.4 (2.8)[c]	3.0 (2.8)[d]	3.4 (3.0)
Mastery[f]	24.1 (4.9)[c,d]	26.0 (4.4)[c,e]	26.9 (4.8)[d,e]	25.7 (4.9)
Self-efficacy expectancies[f]	59.4 (10.9)[c,d]	62.2 (10.6)[c,e]	64.9 (10.3)[d,e]	62.3 (10.8)

Notes: GARS = Groningen Activity Restriction Scale.

[a]Substantially poorer functioning indicates worsening of at least 4 points on GARS. Some poorer functioning indicates 1-, 2-, or 3-point worsening on GARS. No change or better functioning indicates no change or better functioning on GARS.

[b]Chi-square, $p < .05$.

[c,d,e]Differences in pairs of observations with respect to either substantially poorer functioning, some poorer functioning, or no change or better functioning; Scheffé test for multiple comparisons, $p < .05$.

[f]Higher scores indicate better functioning.

[g]Higher scores indicate poorer functioning.

of the natural pathway of aging. We based the cutoff score of 4 points on Cohen's effect sizes method (Cohen, 1992). Effect sizes are calculated by dividing the mean change over a period by the standard deviation of that change. An effect size of $d = 0.20$ indicates a small effect, an effect size of $d = 0.50$ a medium effect, and $d = 0.80$ indicates a large effect (Cohen, 1992). The total sample of the present study (N = 1,765) deteriorated 4.5 points on the GARS, with $SD = 8.4$ (also see Table 2 in later text). A deterioration of 4 points or higher is equivalent with an effect size of $d = 0.48$ (4.0/8.4) or higher and was considered to be substantial.

Next, we conducted two types of multinomial logistic regression analyses. The first type of multinomial logistic regression analyses included only one individual predictor and the three sociodemographics as well as baseline disability as control variables in each equation. The second type of multinomial logistic regression analyses included all predictors as well as baseline disability in the equation to study the unique contribution of each predictor. We estimated odds ratios (ORs) and corresponding 95% confidence intervals (CIs). The multinomial logistic regression approach allowed us to simultaneously compare the two outcomes (i.e., substantially poorer functioning and no change or improvement in functioning) with the reference category (some decline in functioning; normal aging). The OR that was based on a comparison of somewhat poorer functioning (reference group) with substantially poorer functioning indicated a *risk* effect of the predictor. The OR that was based on a comparison of somewhat poorer functioning with no change or better functioning indicated a *protective* effect of the predictor. We analyzed data by using SPSS PC software, version 10.1.

Preliminary Analysis

As mentioned, we included 1,765 persons in the analyses presented here. Nonparticipants at follow-up in 2001 (all 1993 data were available from 2,793 nonparticipants in 2001) reported in 1993 higher levels of disability (mean score of 24.4 vs 20.6, $p < .05$), chronic medical morbidity (on average 1.3 vs 1.0 conditions, $p < .05$), depressive symptoms (4.7 vs 3.7, $p < .05$), and neuroticism (3.8 vs 3.4, $p < .05$) compared with the participants at follow-up. Nonparticipants at follow-up reported in 1993 lower levels of perceived health (63.9 vs 72.0, $p < .05$), social support (25.2 vs 25.9, $p < .05$), mastery (23.9 vs 25.7, $p < .05$), self-efficacy expectancies (58.2 vs 62.3, $p < .05$), and lower levels of education (2.9 vs 3.3, $p < .05$) compared with the participants at follow-up. Furthermore, nonparticipants were older (72.0 vs 66.9 years, $p < .05$).

Results

Table 2 presents the descriptive statistics for all variables in the total study sample (n = 1,765) and according to the three trajectories of change in disability between 1993 and 2001. Except for social support interactions, all differences between substantially poorer functioning and no change or better functioning were statistically significant. This indicates that those older people with substantial deterioration in disability between 1993 and 2001 reported more chronic medical conditions and lower levels of perceived health, reported more depressive symptoms and higher levels of neuroticism, and lower levels of mastery and self-efficacy expectances in 1993 compared with the persons without deterioration in functioning. There is hardly any difference in percentages of female participants between the trajectories of substantially and somewhat poorer functioning. However, the percentage of female participants in the no change or better functioning group was considerable lower. In addition, this latter group was younger and more educated compared with the other groups.

Table 3 shows the intercorrelations between the selected predictors and between these predictors and disability in 1993.

Table 3. Cross-Sectional Intercorrelations Between Selected Covariates and Predictors in 1993 and Disability in 1993 ($n = 1{,}765$)

	1	2	3	4	5	6	7	8	9	10
1. Gender (0 = male, 1 = female)										
2. Age	.08*									
3. Educational level	−.28*	−.17*								
4. No. of chronic conditions	.13*	.08*	−.04							
5. Perceived health[a]	−.10*	−.02	.05*	−.51*						
6. Depressive symptoms[b]	.11*	.07*	−.18*	.18*	−.38*					
7. Social support[a]	.18*	−.09*	.08*	.07*	−.03	−.13*				
8. Neuroticism[b]	.21*	−.05*	−.07*	.19*	−.33*	.43*	.01			
9. Mastery[a]	−.17*	−.12*	.16*	−.18*	.38*	−.39*	.09*	−.39*		
10. Self-efficacy expectancies[a]	−.20*	−.11*	.26*	−.11*	.24*	−.35*	.12*	−.39*	.55*	
11. Disability in 1993[b]	.07*	.21*	−.09*	.29*	−.40*	.20*	.07*	.07*	−.22*	−.14*

[a]Higher scores indicate better functioning.
[b]Higher scores indicate poorer functioning.
*$p < .05$.

The results show that particularly perceived health, depressive symptoms, neuroticism, mastery, and self-efficacy expectancies were interrelated. Although disability in 1993 was significantly related to all selected predictors, disability in 1993 was most strongly related to perceived health.

Table 4 shows the results of the multinomial logistic regression analyses comprising the effects of the separate, individual predictors adjusted for age, gender, and level of education as well as for disability in 1993. We identified the number of chronic medical conditions, perceived health, depressive symptoms, neuroticism, mastery, and self-efficacy expectancies as risk factors as well as protective factors. Depending on their value, these factors predict either deterioration or improvement in functioning in the expected direction. This means that more chronic conditions, poorer perceived health, more depressive symptoms, higher levels of neuroticism, and lower levels of mastery and self-efficacy expectancies were associated with substantially poorer functioning as compared with somewhat poor functioning. Fewer chronic conditions, better perceived health, fewer depressive symptoms, lower levels of neuroticism, and higher levels of mastery and self-efficacy expectancies were associated with no change or improvement in functioning as compared with somewhat poorer functioning.

Social support did not influence trajectories of disability. With respect to the confounders, age and gender (partly) were related to trajectories of disability.

We studied the impact of the separate chronic medical conditions (as described in the Methods section) on both trajectories while adjusting for gender, age, educational level, and baseline disability as well. The results (not tabulated) indicated only a significant protective effect for asthma or chronic bronchitis: persons who did not have this chronic disease showed better functioning than did those who did have it (OR = 0.50; CI = 0.30–0.84).

Table 5 comprises the outcomes of the multinomial logistic regression analyses including all predictors simultaneously in the regression equation. This gives us the opportunity to identify the unique contribution of each of the predictors. Although we identified a high level of depressive symptoms as a risk factor, a low level in itself seemed not to be protective. Although a positive perception of health was associated with a trajectory of healthy functioning, we did not identify a negative perception as a risk factor. Furthermore, we identified differential effects for mastery and self-efficacy expectancies. Whereas a lower level of mastery was a risk factor for functional decline, a higher level of self-efficacy expectancies was protective against functional decline.

Discussion

Our objective in this study was to examine whether predictors of functional decline in older persons (risk factors) were the same as predictors of high functioning in old age (protective factors). We included three sociodemographic variables as covariates (gender, age, and level of education), three health indicators (number of chronic medical conditions, perceived health, and depressive symptoms), and four psychosocial variables (social support, neuroticism, mastery, and self-efficacy

Table 4. Risk Effects and Protective Effects by Multinomial Logistic Regression: Odds Ratios and 95% Confidence Intervals for Individual Predictors

	Risk Effect[a]		Protective Effect[b]	
Variable	Odds Ratio	(95% CI)	Odds Ratio	(95% CI)
Covariates				
Gender (0 = female, 1 = male)[c]	0.86	0.65–1.13	0.60*	0.46–0.78
Age[c]	1.07*	1.04–1.09	0.93*	0.91–0.95
Educational level[c]	0.93	0.82–1.06	1.03	0.91–1.16
Predictors				
No. of chronic conditions[d]	1.22*	1.08–1.38	0.82*	0.72–0.93
Perceived health[d,e]	0.99*	0.98–0.99	1.02*	1.01–1.03
Depressive symptoms[d,f]	1.10*	1.06–1.15	0.94*	0.89–0.98
Social support[d,e]	1.01	0.98–1.04	1.00	0.98–1.03
Neuroticism[d,f]	1.07*	1.02–1.12	0.95*	0.90–0.99
Mastery[d,e]	0.94*	0.91–0.96	1.04*	1.01–1.07
Self-efficacy expectancies[d,e]	0.98*	0.97–0.99	1.02*	1.01–1.04

[a]Risk effect compares substantially poorer functioning ($n = 643$) with some poorer functioning as reference group ($n = 385$).
[b]Protective effect compares no change or better functioning ($n = 737$) with some poorer functioning as reference group ($n = 385$).
[c]Gender, age, and educational level are controlled for each other as well as for disability at baseline in 1993.
[d]Individual effects of number of chronic conditions, perceived health, depressive symptoms, social support, neuroticism, mastery, and self-efficacy are controlled for gender, age, and educational level as well as for disability at baseline in 1993.
[e]Higher scores indicate better functioning.
[f]Higher scores indicate poorer functioning.
*$p < .05$.

Table 5. Risk Effects and Protective Effects by Multinomial Logistic Regression: Odds Ratios and 95% Confidence Intervals for All Predictors Simultaneously

	Risk Effect[a]		Protective Effect[b]	
Variable	Odds Ratio	(95% CI)	Odds Ratio	(95% CI)
Covariates				
Gender (0 = female, 1 = male)	0.72*	0.54–0.97	0.65*	0.49–0.86
Age	1.08*	1.05–1.10	0.92*	0.90–0.94
Educational level	0.96	0.84–1.10	0.98	0.86–1.11
Predictors				
No. of chronic conditions	1.12	0.97–1.29	0.93	0.80–1.07
Perceived health[c]	0.99	0.99–1.00	1.01*	1.01–1.02
Depressive symptoms[d]	1.07*	1.02–1.12	0.98	0.93–1.03
Social support[c]	1.02	0.99–1.05	1.00	0.97–1.03
Neuroticism[d]	0.99	0.94–1.05	1.00	0.95–1.06
Mastery[c]	0.96*	0.93–0.99	1.00	0.97–1.04
Self-efficacy expectancies[c]	1.00	0.98–1.01	1.02*	1.00–1.03

Note: All predictors were included in the analysis simultaneously as well as disability at baseline in 1993.

[a]Risk effect compares substantially poorer functioning ($n = 643$) with some poorer functioning as reference group ($n = 385$).

[b]Protective effect compares no change or better functioning ($n = 737$) with some poorer functioning as reference group ($n = 385$).

[c]Higher scores indicate better functioning.

[d]Higher scores indicate poorer functioning.

*$p < .05$.

expectancies). When analyzed separately, all selected predictors were, depending on their value, identified as risk factors as well as protective factors, except for social support. In a multivariate approach, we identified a high level of depressive symptoms as risk factor, whereas a low level in itself seemed not to be protective. We identified perceived health only as a protective factor. Finally, we identified a differential effect for mastery and self-efficacy expectancies. Although a low level of mastery seemed to be a risk for developing further disability, a high level of self-efficacy expectancies was protective against functional decline. The differences between the outcomes of the univariate and the multivariate approach may be due to the interrelationships of the selected predictors (see Table 3).

The question remains of how to evaluate the (multivariate) results of this study: a differential impact of perceived health, depressive symptoms, mastery, and self-efficacy expectancies on trajectories of high and low functioning over an 8-year period in community-living older adults. We may conclude that older persons with a high level of depressive symptoms or a low level of mastery (the extent to which one regards one's own life chances as being under one's own control in contrast to being fatalistically ruled) are particularly at risk for functional decline. However, the absence of depressive symptoms or low levels of mastery does not "guarantee" trajectories of *healthy* functioning. Other factors, such as genetic features, may be at work here. The differential effect of mastery and self-efficacy expectancies is remarkable. One can argue that low levels of mastery may induce feelings of helplessness in the face of (health) problems, whereas high levels of self-efficacy expectancies may induce healthy behavior such as physical activity and therefore protect against functional decline. In addition, better perceived health is predictive for better functioning in the future.

Some comments have to be made regarding these results. For several reasons (see the Methods section), we included 1,765 persons in our study although the source population of the GLAS consisted of 5,279 persons. Nonparticipants in 2001 reported higher levels of disability in 1993, lower levels of education, perceived health, social support, mastery, and self-efficacy expectancies and higher level of chronic conditions and depressive symptoms compared with the participants in 2001 (see Methods). Furthermore, nonparticipants were older than the participants. Although that substantial attrition is common in studies among older persons, this may have affected our outcomes. The attrition of more disabled and vulnerable persons may have weakened (and therefore underestimated) the identified associations in our sample. However, particularly *descriptive* outcomes in aging studies may be strongly affected by attrition, but attrition not always seems to be a serious problem when *associations* between variables are the focus of study, as is the case here (Crawford, Tennstedt, & McKinlay, 1995; Kempen & Van Sonderen, 2002). A second comment refers to the meaning of the associations between the functional trajectories and the risk and protective factors: we identified several *statistical significant* factors that were related to functional trajectories, but one can argue about the *clinical* impact of these factors. Finally, we covered a long period of time, and levels of functioning in either 1993 or 2001 may be influenced by temporary health problems (like a cold or a broken leg), which could have threatened the reliability of the results. However, the (univariate) results from Table 2 clearly indicated associations in the right direction that are well known from the literature: functional decline is related to gender, age, educational level, chronic conditions, perceived health, depressive symptoms, mastery, and self-efficacy expectancies. This supports our classification of functional trajectories. A strong and unique point of the present study is its 8-year longitudinal, prospective character.

The results of the present study are largely consistent with previous risk factor research, except for educational level and social support (see the beginning of the article). The results furthermore show that it makes sense to distinguish between different types of functional trajectories of older persons. We may conclude that risk and protective factors of functional decline in older persons are not the same. These results support the idea that differences exist between pathologic and salutogenic predictors of subsequent functioning in older persons. These differences must be taken into account when interventions and programs to prevent or delay the onset of disability or to improve functional ability in late life are developed and evaluated. More specifically, such interventions should not only include the treatment of depressive symptoms and the improvement of mastery to reduce the risk of disablement in the future, but should also focus on the improvement of health perceptions and self-efficacy expectancies to promote healthy functioning.

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